UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/761,626	01/22/2004	Meng-An Pan	58268.00346	3538

		EXAMINER
32294 7590 04/19/2007		BENGHUZZI, MOHSIN M
SQUIRE, SANDERS & DEMPSEY L.L.P.		
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SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	04/19/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

PTOL-90A (Rev. 10/06)

	Application No.	Applicant(s)
Office Action Summary	10/761,626	PAN ET AL.
	Examiner	Art Unit	
	Mohsin (Ben) Benghuzzi	2611	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE <u>3</u> MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1) ☒ Responsive to communication(s) filed on <u>22 January 2004</u>.

2a) ☐ This action is **FINAL**.   2b) ☒ This action is non-final.

3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4) ☒ Claim(s) <u>1-19</u> is/are pending in the application.

    4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5) ☐ Claim(s) _____ is/are allowed.

6) ☒ Claim(s) <u>1-19</u> is/are rejected.

7) ☐ Claim(s) _____ is/are objected to.

8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9) ☐ The specification is objected to by the Examiner.

10) ☒ The drawing(s) filed on <u>22 January 2004</u> is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.

    Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

    Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

    a) ☐ All   b) ☐ Some * c) ☐ None of:

    1. ☐ Certified copies of the priority documents have been received.

    2. ☐ Certified copies of the priority documents have been received in Application No. _____.

    3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

    * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO/SB/08)
    Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413)
    Paper No(s)/Mail Date. _____.

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

DETAILED ACTION

Double Patenting

1.   The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory obviousness-type double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

        A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent either is shown to be commonly owned with this application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement.

        Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

2.   Claims 1-19 are provisionally rejected on the ground of nonstatutory double patenting over claims 1-19 of copending Application No. 10/877,975. This is a provisional double patenting rejection since the conflicting claims have not yet been patented.

        The subject matter claimed in the instant application is fully disclosed in the referenced copending application and would be covered by any patent granted on that copending application since the referenced copending application and the instant application are claiming common subject matter, as follows:

1) Claims 2-9 and 12-19 in the instant Application and the referenced copending

Application are identical.

2) Claims 1, 10, and 11 in the instant Application and the referenced copending

Application are identical except for the copending Application containing in

said claims the additional limitation of converting the modulated signal to an

analog signal using randomly selected current sources.

Claim Rejections - 35 USC § 103

3.   The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all

obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set
> forth in section 102 of this title, if the differences between the subject matter sought to be patented and
> the prior art are such that the subject matter as a whole would have been obvious at the time the
> invention was made to a person having ordinary skill in the art to which said subject matter pertains.
> Patentability shall not be negatived by the manner in which the invention was made.

4.   Claims 1-4, 7-14, and 17-19 are rejected under 35 U.S.C. 103(a) as being

unpatentable over Kumar (US Pub 2004/0223553) in view of Robinson et al. (US

2004/0263365).

1) Regarding claim 1:

Kumar teaches a method comprising:

performing delta sigma modulation on a signal (Paragraph 0015, lines 9-12 and

paragraph 0020, lines 10-12);

converting the modulated signal to an analog signal (Paragraph 0035, page 6,

lines 41-43);

converting the analog signal to an RF signal (Paragraph 0034, lines 5-25); and

transmitting the RF signal (Paragraph 0034, lines 24-25).

Kumar does not specifically teach the delta sigma modulation is performed on a digital quadrature signal, however, Robinson et al. discloses a system in which the delta sigma modulation is performed on a digital quadrature signal (Paragraph 0051 lines 3-7 and lines 25-31).

It is desirable that the digital signal to be processed by a delta sigma modulator is a digital quadrature signal. It is well know in the art that I/Q modulation is a highly efficient way to transfer digital data. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have the signal processed by the delta sigma modulator of Kumar be a digital quadrature signal, as Robinson et al. teaches, in order to result in a highly efficient method of transmitting the data.

2) Regarding claim 2:

Kumar does not disclose the modulation reduces the number of bits of the digital quadrature signal. However, Robinson et al. disclose the modulation reduces the number of bits of the digital quadrature signal (Paragraph 0041, lines 2-4).

It is advantageous to have a delta sigma modulation reduce the number of bits of a digital signal. Reduction in the number of bits for each sample increases transmission rate as well as decreases processing time (see Robinson et al. paragraph 0041). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have the delta sigma modulator of Kumar reduce the number of bits of the digital quadrature signal, as Robinson et al. teach, in order to reduce processing time and increase transmission rate.

3) Regarding claim 3:

Robinson et al. do not specifically disclose the bit reduction in claim 2 is from 10

bits to 4 bits, however, such limitation is merely a matter of design choice and would

have been obvious in the system of Kumar and Robinson et al. Reduction of the

number of bits to a specific number would depend on the bandwidth allocated to the

transmitted signal. A transmitted signal bandwidth must be restricted to the portion of

the channel bandwidth allocated to it. Restriction of transmitted signal bandwidth is

achieved by restricting transmission bit rate and, thus, by restricting number of bits per

sample.

4) Regarding claim 4:

Kumar teaches, further comprising amplifying the RF signal before the transmitting

(Block 210 in Fig. 3).

5) Regarding claim 7:

Kumar teaches, wherein the digital quadrature signal is formed using one of GFSK,

4-PSK, and 8-PSK modulations (paragraph 0018, lines 7-10, wherein, QPSK is

understood to be equivalent to 4-PSK).

6) Regarding claim 8:

Robinson et al. teach performing interpolation filtering on the digital quadrature

signal before the delta sigma modulation (paragraph 0026, lines 3-7).

7) Regarding claim 9:

Kumar or Robinson et al. do not specifically teach the interpolation filtering reduces

the digital quadrature signal from 12 bits to 10 bits, however, such limitation is merely a

matter of design choice and would have been obvious in the system of Kumar and

Robinson et al. As discussed in claim 3, a transmitted signal bandwidth must be

restricted to the portion of the channel bandwidth allocated to it. Restriction of

transmitted signal bandwidth is achieved by restricting transmission bit rate and, thus,

by restricting number of bits per sample.

8) Regarding claim 10:

Kumar discloses a system, comprising:

means for performing delta sigma modulation on a signal (Paragraph 0015, lines

9-12 and paragraph 0020, lines 10-12);

means for converting the modulated signal to an analog signal (Paragraph 0035,

page 6, lines 41-43);

means for converting the analog signal to an RF signal (Paragraph 0034, lines 5-

25); an

means for transmitting the RF signal (Paragraph 0034, lines 24-25).

Kumar does not specifically disclose means in which the delta sigma modulation is

performed on a digital quadrature signal, however, as discussed in claim 1 above,

Robinson et al. discloses a system in which the delta sigma modulation is performed on

a digital quadrature signal (Paragraph 0051 lines 3-7 and lines 25-31).

9) Regarding claim 11:

Kumar discloses an RF transmitter, comprising:

a delta sigma modulator capable of performing delta sigma modulation on a

digital quadrature signal (Paragraph 0015, lines 9-12 and paragraph 0020, lines 10-12);

a DAC, communicatively coupled to the delta sigma modulator, capable of

converting the modulated signal to an analog signal (Paragraph 0035, page 6, lines 41-

43);

a mixer, communicatively coupled to the DAC, capable of converting the analog

signal to an RF signal (Paragraph 0034, lines 5-25); and

an antenna, communicatively coupled to the mixer, capable of transmitting the

RF signal (230 in Fig. 3 and paragraph 0034, lines 24-25).

Kumar does not specifically disclose a transmitter in which the delta sigma

modulation is capable to be performed on a digital quadrature signal, however, as

discussed in claim 1 above, Robinson et al. discloses a system in which the delta sigma

modulation is performed on a digital quadrature signal (Paragraph 0051 lines 3-7 and

lines 25-31).

10) Regarding claim 12:

As discussed in claim 2 above, Robinson et al. disclose the modulation reduces the

number of bits of the digital quadrature signal (Paragraph 0041, lines 2-4).

11) Regarding claim 13:

As discussed in claim 3 above, the reduction in number of bits of the digital

quadrature signal from 10 bits to 4 bits is merely a matter of design choice and would

have been obvious in the system of Kumar and Robinson et al.

12)Regarding claim 14:

Kumar discloses, further comprising a power amplifier, communicatively coupled to the antenna and the mixer, capable of amplifying the RF signal before the antenna transmits the RF signal (Block 210 in Fig. 3).

13)Regarding claim 17:

Kumar discloses, wherein the digital quadrature signal is formed using one of GFSK, 4-PSK, and 8-PSK modulations (paragraph 0018, lines 7-10, wherein, QPSK is understood to be equivalent to 4-PSK).

14)Regarding claim 18:

As discussed in claim 8 above, Robinson et al. disclose an interpolation filter capable of performing interpolation filtering on the digital quadrature signal before the delta sigma modulation (paragraph 0026, lines 3-7).

15)Regarding claim 19:

As discussed in claim 9 above, the limitation that interpolation filtering reduces the digital quadrature signal from 12 bits to 10 bits is merely a matter of design choice and would have been obvious in the system of Kumar and Robinson et al.

5.   Claims 5 and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kumar (US Pub 2004/0223553) and Robinson et al. (US 2004/0263365).

1) Regarding claim 5:

Kumar or Robinson et al. do not specifically teach the delta sigma modulation includes 2nd order delta sigma modulation, however, such limitation is merely a matter of

design choice and would have been obvious in the system of Kumar and Robinson et al. It is well known in the relevant art that the higher the order of the delta sigma modulator, the less the quantization noise, i.e., the higher the order of the delta sigma modulator, the higher the signal-to-noise ratio. Thus, using a 2nd order delta sigma modulator and not a 1st order one results in higher signal-to-noise ratio.

2) Regarding claim 15:

As discussed in claim 5 above, the limitation that the delta sigma modulator includes a 2nd order delta sigma modulator is merely a matter of design choice and would have been obvious in the system of Kumar and Robinson et al.

6.   Claims 6 and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kumar (US Pub 2004/0223553) and Robinson et al. (US 2004/0263365), and further in view of Chu et al. (US 5,166,959).

1) Regarding claim 6:

Kumar or Robinson et al. do not teach, further comprising coding the modulated signal with a thermometer code. However, Chu et al. teach, further comprising coding the modulated signal with a thermometer code (Column 4, lines 20-35).

It is advantageous to code a signal with a thermometer code. The advantage of coding using a thermometer code is that any error affects only one bit in the coded word (see Chu et al., column 4, lines 35-39). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to code the modulated signal

of Kumar and Robinson et al. with a thermometer code, as Chu et al. teaches, in order

to reduce the number of bits in a coded word that are in error.

2) Regarding claim 16:

As discussed in claim 6 above, Chu et al. disclose a delta sigma modulator capable

of coding the modulated signal with a thermometer code (Column 4, lines 20-35).

Conclusion

7.   The prior art made of record and not relied upon is considered pertinent to

applicant's disclosure. Khoury et al. (US 6,121,910) disclose a frequency translating

sigma delta modulator for converting an analog input signal to a digital output signal.

8.   Any inquiry concerning this communication or earlier communications from the

examiner should be directed to Mohsin (Ben) Benghuzzi whose telephone number is

(571) 270-1075. The examiner can normally be reached Monday through Friday,

8:30am- 5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's

supervisor, Mohammad Ghayour can be reached on (571) 272-3021. The fax phone

number for the organization where this application or proceeding is assigned is 571-

273-8300.

9.   Information regarding the status of an application may be obtained from the

Patent Application Information Retrieval (PAIR) system. Status information for

published applications may be obtained from either Private PAIR or Public PAIR.

Status information for unpublished applications is available through Private PAIR only.

For more information about the PAIR system, see http://pair-direct.uspto.gov. Should

you have questions on access to the Private PAIR system, contact the Electronic

Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a

USPTO Customer Service Representative or access to the automated information

system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Mohsin (Ben) Benghuzzi   April 4, 2007

MOHAMMED GHAYOUR
SUPERVISORY PATENT EXAMINER